

IN THE CLAIMS:

1. (Amended) A shape processor for imitating the shape of an object in a three-dimensional space, the shape processor comprising:

a reference information acquiring unit for acquiring reference body information for specifying the shape of a reference body which is a tetrahedron composed of four identical faces which are isosceles triangles, wherein the ratio of lengths of its sides is 2 : $\sqrt{3}$: $\sqrt{3}$, side setting information for setting two sides of said reference body [[in a twisted position]] perpendicular to each other as first and second sides, and face setting information for setting two faces sharing said first side of said reference body as first and second faces, and for assigning the values of 0 to one of the two faces sharing said first side, and for assigning 1 to the other of the two faces sharing said first side;

an approximating unit for forming a chain of the reference bodies by connecting said first side of a first reference body and said second side of a second reference body, and for imitating the shape of an object using the chain of said reference bodies, ~~by putting said first side of said first reference body on said second side of said second reference body and~~ putting either said first or second face of said first reference body on the corresponding face of said second reference body, according to the information representing the shape of the object and the information acquired by said reference information acquiring unit; and

an approximation information storage unit for storing approximation information representing which of said first and second faces of said first reference body is put on the corresponding face of said second reference body by sequence of 0 or 1 assigned to one two faces of said reference body which is put on the corresponding face of the adjacent reference body.

2. (Amended) A shape processor for reproducing the shape of an object in a three-dimensional space, the shape processor comprising:

a reference information acquiring unit for acquiring reference body information for specifying the shape of a reference body which is a tetrahedron composed of four identical faces which are isosceles triangles, wherein the ratio of lengths of its sides is 2

:sqrt (3) : sqrt (3), side setting information for setting two sides of said reference body
[[in a twisted position]] perpendicular to each other as first and second sides, and face
setting information for setting two faces sharing said first side of said reference body as
first and second faces, and for assigning the values of 0 to one of the two faces sharing
said first side, and for assigning 1 to the other of the two faces sharing said first side;

an approximation information storage-acquiring unit for acquiring approximation
information representing which of said first and second faces of said first reference
body included in a chain of the reference bodies formed by connecting said first side of
a first reference body and said second side of a second reference body is put on the
corresponding face of said second reference body connected to said first reference
body, by sequence of 0 or 1 assigned to one two faces of said reference body put on
the corresponding face of the adjacent reference body; and

and an reproducing unit for forming chain of the reference bodies by connecting
said first side of a first reference body and said second side of a second reference
body, and for reproducing the shape of an object using the chain of reference bodies by
putting said first side of said first reference body on said second side of said second
reference body and putting either said first or second face of said first reference body
on the corresponding face of said second reference body, according to the information
acquired by said reference information acquiring unit and the approximation information
acquired by said approximation information storage unit.

3. (Original) A shape processor as claimed in claim 1, wherein said reference information acquiring unit acquires reference body information which specifies a tetrahedron composed of such four identical isosceles triangles that the ratio of length of its sides is $2 : \sqrt{3} : \sqrt{3}$.

4. (Original) A shape processor as claimed in claim 2, wherein said reference information acquiring unit acquires reference body information which specifies a tetrahedron composed of such four identical isosceles triangles that the ratio of length of its sides is $2 : \sqrt{3} : \sqrt{3}$.

5. (Amended) A shape processing program for imitating the shape of an object in a three-dimensional space, the shape processing program comprising:

a reference information acquiring module for acquiring reference body information for specifying the shape of a reference body which is a tetrahedron composed of four identical faces which are isosceles triangles, wherein the ratio of lengths of its sides is $2 : \sqrt{3} : \sqrt{3}$, side setting information for setting two sides of said reference body ~~[[in a twisted position]]~~ perpendicular to each other as first and second sides, and face setting information for setting two faces sharing said first side of said reference body as first and second faces, and for assigning the values of 0 to one of the two faces sharing said first side, and for assigning 1 to the other of the two faces sharing said first side;

an approximating module for forming a chain of the reference bodies by connecting said first side of a first reference body and said second side of a second reference body, and for imitating the shape of an object using said reference bodies by ~~putting said first side of said first reference body on said second side of said second reference body and~~ putting either said first or second face of said first reference body on the corresponding face of said second reference body, according to the information representing the shape of the object and the information acquired by said reference information acquiring module; and

an approximation information storage module for storing approximation information representing which of said first and second faces of said first reference body is put on the corresponding face of said second reference body by sequence of 0 or 1 assigned to one two faces of said reference body which is put on the corresponding face of the adjacent reference body.

6. (Amended) A shape processing program for reproducing the shape of an object in a three-dimensional space, the shape processing program comprising:

a reference information acquiring module for acquiring reference body information for specifying the shape of a reference body which is a tetrahedron composed of four identical faces which are isosceles triangles, wherein the ratio of lengths of its sides is $2 : \sqrt{3} : \sqrt{3}$, side setting information for setting two sides of said reference body ~~[[in a twisted position]]~~ perpendicular to each other as first and

second sides, and face setting information for setting two faces sharing said first side of said reference body as first and second faces, and for assigning the values of 0 to one of the two faces sharing said first side, and for assigning 1 to the other of the two faces sharing said first side;

an approximation information storage-acquiring module for acquiring approximation information representing which of said first and second faces of said first reference body is put on the corresponding face of said second reference body included in a chain of the reference bodies formed by connecting said first side of a first reference body and said second side of a second reference body; and

an reproducing module for forming chain of the reference bodies by connecting said first side of a first reference body and said second side of a second reference body, and for reproducing the shape of an object using reference bodies by ~~putting said first side of said first reference body on said second side of said second reference body and~~ putting either said first or second face of said first reference body on the corresponding face of said second reference body, according to the information acquired by said reference information acquiring module and the approximation information acquired by said approximation information storage module.

7. (Original) A shape encoding method which encodes the shape of a given object in a three-dimensional space by representing the relation among reference bodies obtained by dividing the object, the method comprising steps of:

encoding the shape into a sequence of 0 and 1 using reference bodies where each reference body is a tetrahedron composed of such four identical isosceles triangles that the ratio of length of its sides is $2 : \sqrt{3} : \sqrt{3}$;

connecting each reference body with another one or two reference bodies to form a chain at the longer edges in such a way that two faces of a reference body can be brought into contact with the corresponding faces of the following reference body, one pair at a time, by rotation around the longer edge shared by the two reference bodies;

encoding the shape by specifying the folding of the chain, i.e., the folding at each longer edge between two consecutive reference bodies in said chain;

assigning the values of 0 and 1 to the two faces of said reference body which share a longer edge, 0 for a face and 1 for the other, in advance; and

using the values to describe the folding at the longer edges, that is, which face of said reference body is in contact with the corresponding face of said following reference body.

8. (New) A method for acquiring approximation information representing a three dimensional form of a object comprising:

an object information acquiring step for acquiring object information representing three dimensional form of a object;

a reference information acquiring step for acquiring reference body information for specifying the shape of a reference body which is a tetrahedron composed of four identical faces which are isosceles triangles, wherein the ratio of lengths of its sides is $2 : \sqrt{3} : \sqrt{3}$, side setting information for setting two sides of said reference body [[in a twisted position]] perpendicular to each other as first and second sides, and face setting information for setting two faces sharing said first side of said reference body as first and second faces, and for assigning the values of 0 to one of the two faces sharing said first side, and for assigning 1 to the other of the two faces sharing said first side;

approximation step for forming chain of the reference bodies by connecting said first side of a first reference body and said second side of a second reference body, and specifying either of said first face or said second face of the first reference body should be put on the corresponding face of the second reference body; and

a storing step for storing approximation information representing either of said first face or said second face specified in said approximation step.